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The Determinants of Dutch Capital Structure Choice

Abstract

This paper uses the structural equation modeling (SEM) technique to empirically test the determinants of capital structure choice for Dutch firms. We include major factors identified by capital structure theories and construct proxies for these factors with consideration of specific institutional settings in the Netherlands. We also carefully rescale the observed variables in order to conform with the linear structure of the model and the multivariate normality assumption. Our empirical results shed many important insights on Dutch firms' financing behavior. In particular, we identified important factors that have so far been ignored in the literature for the Dutch capital structure choice. Furthermore our results provide evidence supporting the "static trade-off" hypothesis. While the "pecking-order" behavior is observed for Dutch firms, our results cast doubt on the rationale of asymmetric information behind the "pecking-order" hypothesis. We also point out that the static cross-section evidence is not sufficient to conclude whether or not the management of Dutch firms is entrenched. Models based on the dynamic behavior of firms' capital structure choice are called for such tests.

JEL Classification: G32, C31.

Key Words: Capital Structure, Structural Equation Model, Dutch Firms

1 Introduction

Over the past several decades, theories on a firm's capital structure choice have evolved along many directions. Different models have been built in the literature to explain a firm's financing behavior[1]. Among the main competing theories in explaining a firm's capital structural choice are the static trade-off hypothesis (Modigliani and Miller, 1963) and the "pecking-order" hypothesis (Myers, 1984; Myers and Majluf, 1984). The static trade-off hypothesis claims that the optimal level of a firm's leverage is achieved by weighing the benefits of debt financing against the cost of potential financial distress. From a dynamic point of view, it is argued that the optimal leverage level can change due to changes in a firm's profitability level, non-debt tax shield level, etc. Therefore, even when a firm's leverage changes from year to year, the trade-off hypothesis cannot be simply rejected because the optimal leverage level itself may differ over time. The "pecking order" hypothesis claims that a firm's financing choice simply follows the order of internal financing, debt financing and equity financing (Myers and Majluf, 1984). The argument is such that due to asymmetric information, the financial market cannot distinguish a good project from a bad one. Avoiding to be discounted, a firm with a good investment project will not go to the equity market to raise additional funds, instead it would prefer to use internal funds or debt. Apart from the trade-off hypothesis and "pecking-order" hypothesis, other theories have also been developed to explain a firm's capital structure choices[2].

The main objective of this paper is to empirically test the determinants of capital structure choice for Dutch firms. In particular, we also identify the factors that are pertaining

[1] For a comprehensive survey, readers can refer to Harris and Raviv (1991) .

[2] For example, Jensen and Meckling (1976) state that debt may induce shareholders expropriate wealth from bondholders. Myers (1977) argues that a firm may forgo a positive NPV project if it perceives that the profit generated from the project will be used mainly to pay-off existing debt. Smith and Warner (1979) point out that debt convenants can not totally solve the conflict of interest between bondholders and shareholders because these convenants not only can prevent a firm from enganging in value-decreasing projects but also from engaging in value-increasing projects. Grossman and Hart (1982), Jensen (1986) and Zwiebel (1996) discuss the agency costs arised from the separation of ownership and control, mainly the conflict of interest between managers and shareholders, they suggest using debt as a disciplining device. Ross (1977, Miller and Rock (1985) and Ambarish et al. propose that a firm's capital structure choice as well as dividend policy may be used as signaling devices given that there is asymmetric information between informed managers and uninformed outside shareholders. Titman (1984), Brander and Lewis (1986) and Maksimovic and Titman (1991) argue that capital structure choice can be affected by the industrial structure a firm is facing.

to the specific institutional settings in the Netherlands. The approach used in this paper is the structural equation modeling (SEM) technique. In capital structure theory, the attributes identified as determinants of a firm's capital structure choice are often not directly observed. That is, there is no single accounting indicator that can be used as an exact representation of each attribute. Instead, the theoretical attributes are often related to one or more accounting indicators (often referred to as proxies of the attributes) with embedded measurement error. Consequently, in the empirical analysis of capital structure choice, in order to investigate the relationship between the capital structure and various attributes or factors, one also needs to identify the relationship between the theoretical attributes and certain observed accounting indicators. In the structural equation modeling framework, the former relationship is referred to as the structural model, while the latter relationship is referred to as the measurement model. The structural equation modeling provides a flexible and powerful approach of simultaneously assessing the quality of measurement and examining the structural relations underlying the theory. In the structural model, we identify the attributes or factors that may affect a firm's leverage based on various theories of capital structure with consideration of the unique aspect of the institutional setting in the Netherlands. In the measurement model, various leverage measures and proxies for the attributes or factors are constructed based on accounting data, keeping in mind the specific Dutch accounting rules and tax laws. Different from previous studies, observed variables in our model have been carefully re-scaled in order to be consistent with model assumptions. For instance, in order to conform with the linear structure of the model and multivariate normality assumption, we use logarithmic standard deviation, instead of standard deviations, of net income and earnings before interest and tax as proxies of a firm's earning volatility. Our analysis shows that this has led to significant improvement in the robustness of parameters estimates.

Our empirical findings shed many important insights on Dutch firms' financing behavior. Firstly, non-debt tax shield (measured by the provision ratio in the Dutch case), which has so far been ignored in the literature, is shown to be a very important factor of Dutch capital structure choice, for both long-term leverage and short-term leverage. Secondly, another important factor that has so far been ignored in the literature is the flexibility component, which is defined as the ratio of cash and marketable securities over current assets. Our results suggest that firms with higher level of flexibility, i.e. higher ratios of cash and marketable securities over current assets, tend to have significantly lower leverage. Thirdly, while both

tangibility and size are positively related to long-term leverage, measured by either book value or market value, size has no significant relationship with short-term debt, and tangibility is negatively related to short-term leverage. The negative relationship between tangibility and short-term debt along with the positive relationship between tangibility and long-term debt may suggest that firms prefer long-term debt to short term debt if it has enough collateral assets. Furthermore, our results provide evidence supporting the "static trade-off" hypothesis. While the "pecking-order" behavior is observed for Dutch firms, our results cast doubt on the rationale of asymmetric information behind the "pecking-order" hypothesis. Finally, we also point out that the static cross-section evidence is not sufficient to conclude whether or not the management of Dutch firms is entrenched. Models based on the dynamic behavior of firms' capital structure choice are called for such tests, which we will pursue in a separate research.

The rest of the paper is organized as follows: Section 2 presents a discussion of the attributes or factors that are identified by various theories as determinants of a firm's capital structure choice, with a brief discussion of the specific institutional settings pertaining to capital structure choice of Dutch firms. Section 3 describes the data set used in our study. Section 4 presents the structural equation model of the capital structure, with discussions on both the structural model and measurement model. Section 5 presents the empirical results and discuss their implications on Dutch firms' financing behavior. Section 6 concludes.

2 The Determinants of Capital Structure

To better understand the purpose of this paper and the empirical results of our model, we first present a brief discussion of the institutional settings in the Netherlands that are pertaining to capital structure choice. Instead of being general and extensive, we focus our discussion only on certain aspects that are unique to the Dutch system.

2.1 Dutch Institutional Settings Pertaining to Capital Structure Choice

A. Tax laws and accounting rules. Not surprisingly, Dutch firms' financing behavior is related to certain aspects of the corporate tax laws. There is a very unique line on the consolidated balance sheets of Dutch firms, which is called "the provision for bad debt and pension liability." In the remaining of the paper, we refer to it as provision. According to the Dutch

tax laws, the provision for bad debt can either be subtracted directly from account receivables on the left-hand side of the balance sheet, or be 100% tax deductible against income and with the remaining portion added back to the provision on the right-hand side of the balance sheet[3]. The same applies to pension liability[4]. The provision amount is a very significant portion of the right-hand side of the balance sheet for Dutch firms. From Table 2 we can see that the average book value long-term leverage, defined as book value of long term debt over book value of total capital assets, is 18.9% for Dutch firms in our sample over the period of 1994-1996, whereas the provision ratio, defined as the provision over book value of total capital assets, is 12.1% over the same period. It is also noted that, due to not so favorable tax rules, stock buy back has not been a very common practice for Dutch companies.

B. Financial institutions. Banks and other financial institutions in the Netherlands play a very important role in firms' debt financing. From Table 1 we can see that the credit market plays a relatively insignificant role in the Netherlands, compared with other European countries. Direct debt financing from banks and other financial institutions account for about 97% of debt financing to the private sector in the Netherlands[5]. Firm-bank relationship is highlighted by the fact that on average a firm has about one interlocking directorate (De Jong and Van Dijk, 1999).

C. Corporate governance issues. The concentration ratio of ownership is very high in the Netherlands, on average 41.4% of a firm's equity is owned by top three largest shareholders (De Jong and Van Dijk, 1999). Takeover defenses are broadly used by Dutch firms[6]. Usu-

[3]For example, if a firm has NLG100 bad debt, it can subtract this amount from its income, assuming the firm's corporate tax rate is 35%, the NLG(100-35)=NLG65 is added to the provision on the right hand side of the balance sheet.

[4]However, it is worth to mention that the pension liability included in the provision is only for top management. The regular employee pension contributions by employers are deducted as a part of the personnel costs.

[5]Also from Table 1, we can see that the concentration level of the Dutch banking sector is extremely high compared with other European countries. This may infer that the cost of debt financing in the Netherlands are higher compared with other countries simply due to the industrial structure of Dutch banking sector.

[6]According to De Jong and Van Dijk (1999), (1) 39.3% of the Dutch firms have priority shares that allow a small number of shares to carry superior voting rights. (2) 63.0% of the Dutch firms have preferred shares arrangement which allows an issue of preferred shares with only 25% of the nominal value to be paid up without further shareholders'approval. (3) In case of a takeover threat, the firm can place the priority shares and the

Table 1: Capital structure choice comparison across European countries

Country	Leverage	Leverage	Indirect (%)	Banks (%)	Concentration	Long (%)
Year	1982	1992	1993	1992	1995	1993
Germany	1.71	1.53	94	89	19.8	78
France	2.61	1.35	85	85	24.5	73
Italy	4.87	3.24	95	89	24.0	44
UK	1.13	1.04	81	92	30.9	50
Belgium	2.50	1.54	93	90	52.3	63
Holland	1.33	1.27	97	73	73.8	77

Note: All figures in the table are from De Bondt (1998). "Leverage" refers to the debt-equity ratio at book value; "indirect" refers to the share of the indirect credit market in % of total credit to private sector; "banks (%)" refers to the share of loans from banks in % of total loans to the private sector; "concentration" refers to the share of the top three banks in % of total assets of banks; "long (%)" refers to the share of long-term credit in % of credit of the corporate sector.

ally Dutch firms adopt multiple anti-takeover barriers. In addition, as for the composition of supervisory board, Dutch firms adopt a process which is often referred to as the "co-option system" where the new members of the supervisory board are elected by the current members.

D. Bankruptcy Laws. As the Dutch bankruptcy law gives more weight to creditors' protection relative to facilitating firms to re-organize and to turn around, firms entering bankruptcy are very likely to be liquidated. Since the liquidation value is generally lower than going concern value, bankruptcy cost is considered to be higher in the Netherlands.

2.2 The Attributes that Affect Capital Structure

The consensus of the attributes that affect capital structure choice is "leverage increases with fixed assets, non-debt tax shields, investment opportunities, and firm size, decreases with volatility, advertising expenditure, the probability of bankruptcy, profitability and uniqueness of the product" (Harris and Raviv, 1991). Due to the unavailability of data, advertising expenditure and uniqueness of the product are not included in our analysis.

preferred shares with a befriended party in exchange for a loan. (4) For 38.3% of the Dutch firms, shareholders own receipts which carry the cashflow rights without the voting rights. (5) 8.3% of the Dutch firms'share only have limited voting power, irrespective of the number of shares an entity possesses.

A. Provision Ratio (PROV)

As mentioned earlier, Dutch firms have a somewhat unique way to shelter their income, which is called the "provision for bad debt and pension liability" on the right-hand side of a firm's consolidated balance sheet. There is no consensus to whether provision should be treated as equity or liability. From a theoretical point of view, provisions (here excluding deferred tax) are clearly liabilities. However, technically, there is no interest cost on these liabilities, the timing and the amount of provisions being added to the balance sheet is at the management's discretion. Therefore, they are not liabilities in a strict sense. Whether or not provisions should be treated as liabilities can directly affect the leverage ratio of Dutch firms. Since the creation of such a line in the consolidated balance sheet is for income smoothing purpose with tax benefit rather than for financing purpose, we classify the provision as non-debt tax shield. Therefore in our analysis, provision is classified neither as debt nor equity. According to the "static trade-off" hypothesis, we expect the relationship between leverage and provision ratio to be negative[7].

We use provision ratio, the provision of bad debt and pension liability over total capital assets which consist of long-term debt, short-term debt, equity and provision (PROV-TA) as the measure of provision (PROV). We argue that this is the most significant and meaningful variable as a proxy of non-debt tax shield in the Dutch case[8]. Cools (1993) uses depreciation ratio[9] (depreciation over book value of total assets) and intangible assets ratio (intangible assets over book value of total assets) as proxy of non-debt tax shield. However, our understanding is that depreciation ratio is set according to certain accounting rules to reflect the

[7]Of course, the lower lever of leverage can not only be caused by the non-debt tax shield ratio. If one believes that Dutch banks and other financial institutions play a role in monitoring firm's financing behavior (after all, 97% of the Dutch private debts are lent by them and only 3% of the private debts are raised from the capital market), it is understandable these banks and financial institutions will make certain that firms they finance are not over-levered beyond their comfort level. Also, the stringent Dutch bankruptcy law perhaps is another factor which prevents firms to use too much debt

[8]Some authors use R&D as proxy of non-debt tax shield (Bradley et al, 1984; Titman and Wessels, 1988). However, only a very limited firms report this amount in the Netherlands. Others use investment tax credits as proxy of non-debt tax shield (Bradley et al., 1984; Titman and Wessels, 1988; and MacKie-Mason, 1990), but such an item is not applicable to the Dutch case (Cools, 1993).

[9]Depreciation ratio is also used in some U.S. studies, DeAngelo and Maslis (1980), Auerbach (1985), Kim and Sörensen, 1986, and Titman and Wessels (1988), e.g.

remaining value of the underlying assets. Based on our sample, we do not find the relationship between depreciation ratio and leverages anywhere near significant. The problem with respect to using intangible assets ratio as proxy of non-debt tax shield is that not all intangible assets are recorded on the balance sheet for Dutch companies. As a matter of fact, only a very small portion of the total intangible assets, mainly patents, are recorded as intangible assets on the balance sheet. Goodwills due to acquisitions are completely written-off when they occur.

B. Tangibility (TANG)

The main reason for tangibility to be positively related to a firm's leverage is because lenders want to assure that their loans are backed up by some collateral assets. Therefore, the higher a firm's asset tangibility is, the higher the leverage can be. Jensen and Meckling (1976) and Myers (1977) further argue that collateralization is an important feature of debt covenant because collateralized loans can only be used in specified projects. Therefore, collateralization can be used to mitigate the conflict of interest between shareholders and lenders in the sense that shareholders cannot expropriate wealth from lenders to engage in extra risky projects. Firms without collateral assets may find it too costly to use debt financing, consequently, they may prefer equity financing.

The positive sign between leverage and asset tangibility is also supported by other arguments. For example, Myers and Majluf (1984) suggest that if a firm has to go to the debt market to raise funds, it is only advantageous for it to sell secured debt, i.e. with collateral. The costs associated with selling un-secured debt may be high enough due to asymmetric information to discourage firms issuing un-secured debt, this is the "pecking order" type of explanation with respect to the relationship between tangibility and leverage. We use fixed assets over total assets (FA-TA) as the measure of tangibility (TANG).

C. Size (SIZE)

It is argued that larger firms tend to be more diversified in their projects, therefore, the probability of total failure, i.e. bankruptcy, is relatively smaller (Bradley et al. 1984; Long and Malitz, 1985; Harris and Raviv, 1991; and Rajan and Zingales, 1995) . Size is often used as an inverse proxy for probability of bankruptcy and is considered to be positively correlated to firms' leverage.

The positive relationship between size and leverage is also viewed as support of "asymmetric information" argument (Myers and Majluf, 1984). It is suggested that the bigger a firm is, there is less information asymmetry, i.e. outsiders have more information about the firm. Therefore, it will be easier for larger firms to get access to loans. We use three variables as proxies of size: logarithmic transformation of sales (lnSALES), logarithmic transformation of total number of workers (lnWORKER) and logarithmic transformation of equity market value (lnMV).

D. Growth Opportunity (GROWTH)

"Pecking-order" hypothesis suggests a negative relationship between leverage and growth opportunity. According to Myers and Majluf (1984), information asymmetry demands an extra premium for firms to raise external funds irrespective of the true quality of their investment project. In the case of issuing debt, the extra premium is reflected in the higher required yield. Firms with growth opportunities may find it too costly to rely on debt to finance its growth. The "under-investment" agency problem also suggests a negative relationship between leverage and growth. Highly leveraged firms are more likely to pass up profitable investment opportunities (Myers, 1977). We use three variables as proxies of growth: percentage change in total asset market value (dTA), percentage change in sales (dSALES) and logarithmic transformation of market to book ratio (lnMBR).

E. Profitability (PROF)

"Pecking-order" hypothesis suggests that firms prefer to use internal funds versus external funds for capital expenditure (Myers and Majluf, 1984). A profitable firm presumably has more internal funds at its disposal than a less profitable firm. Therefore, the relationship between profitability and leverage should be negative. However, Jensen (1986) argues that the relationship between leverage and profitability depends on the effectiveness of the market for corporate control. If the market for corporate control is effective, managers of profitable firms are forced to pay out cash by leveraging up; on the supply side, lenders are also more willing to lend to profitable firms. Therefore, the relationship between leverage and profitability can be positive. On the other hand, if the market for corporate control is ineffective, managers of profitable firms may choose to avoid the disciplining role of debt by leveraging down, then the relationship between leverage and profitability can be negative.

We use two variables as proxies of profitability: the ratio of EBIT over sales (EBIT-SAL) and return on equity (ROE).

F. Earnings volatility (VOLA)

The "static trade-off" hypothesis, "pecking-order" hypothesis, agency costs related theories and product market interaction consideration all predict the negative relationship between leverage and earnings volatility. We use two variables as proxies of earnings volatility: the logarithmic transformation of standard deviation of net income (lnSdNI) and the logarithmic transformation of standard deviation of EBIT (lnSdEBIT).

G. Flexibility (FLEX)

Financial flexibility is usually referred to as the amount of cash that firms build up over time. It can be viewed as negative debt. If there is no effective market for corporate control, management would prefer to retain excess amount of cash (Opler, et al. 1999). "Pecking-order" hypothesis also suggests that there should be a negative relationship between leverage and flexibility. We define the financial flexibility as the ratio of cash and marketable securities over current assets (C$-CA).

H. Industry Dummy (INDU)

To control for industry specific effects on firms' capital structure choice, industry dummy (INCODE) is included in our analysis. We group firms according to NACE (European Community Classification of Economic Activities) criteria and set values for the industry dummy variable.

2.3 Measures of Capital Structure

We use four measures of financial leverage in our analysis. They are book value long-term and short term debt divided by book value total capital assets (LEVBL and LEVBS), and market value long-term and short term debt divided by market value total capital assets (LEVML and LEVMS). Due to data limitation, the book-value debt is used as an approximation of market-value debt.

The book value of total capital assets is calculated as follows. From the consolidated balance sheet, we move the current liability (excluding short term debt) from the right-hand

side of the balance sheet to the left-hand side of the balance sheet, this item can be subtracted from the current assets, the net amount is the net working capital (excluding short term debt). As a result, the items remaining on the right-hand side of the balance sheet are short term debt, long term debt, equity, provision for bad debt and pension liability, and minority interest. The sum of the first four items gives us the book-value of total capital assets used in calculating leverages. To be comparable among firms, minority interest is not included in the total capital assets[10]. To calculate the market value leverages, the sum of book value short-term and long-term debt, provision and market value equity is used as approximation of the market value of total capital assets.

3 The Data

The variables discussed in the previous sections are analyzed over the period of 1992 through 1997. The source of all the data except for the industry code is the "Jaarboek van Nederlandse Ondernemingen". The industry code is based on the NACE activity list.

From the total sample, we deleted all the financial firms (banks, insurance companies and investment companies) and firms that did not have a complete record on the variables required in our analysis. In total, 118 firms are available.

The sampling period is divided into three sub-periods: 1993-1995, 1994-1996, and 1995-1997, with one year lead between successive sub-period. The average of each variable over the sub-periods is calculated. Averaging over three years reduces the measurement error due to year over year random fluctuations. The dependent variables, i.e. the leverages, are measured during the sub-period of 1994-1996. Three indicators of expected future growth (dTA, dSALES, lnMBR) are calculated over the sub-period of 1995-1997. The idea is to use the realized values as proxies of the expected future growth when the capital structure decision is made. The variables used as indicators of size and profitability are calculated over the sub-period of 1993-1995. The idea of using earlier period to calculate profitability and size proxies is to treat them as realized information. The standard deviations of net income and EBIT are calculated over the whole sample period in order to obtain better estimates.

[10] If the minority interest is included, then firms with minority interest will appear to be less levered. However, there is no way for us to know the capital structure of the minority firm. If the minority firm is highly levered, then the leverage ratio we obtain by including minority interest can be quite distorted.

Table 2: Summary Statistics of the Data

Variable	Mean	Median	Minimum	Maximum	Std Dev
LEVBL	0.189	0.180	0.000	0.625	0.156
LEVBS	0.106	0.068	0.000	0.680	0.118
LEVML	0.137	0.107	0.000	0.613	0.133
LEVMS	0.076	0.045	0.000	0.553	0.098
PROV-TA	0.121	0.107	0.010	0.551	0.085
FA-TA	0.351	0.359	0.016	0.925	0.178
lnSALES	13.314	13.305	8.859	18.197	1.786
lnWORKER	7.527	7.546	3.723	12.618	1.793
lnMV	12.507	12.270	8.624	17.924	1.869
dTA	0.209	0.168	-0.159	1.47	0.251
dSALES	0.125	0.117	-0.246	0.661	0.140
lnMBR	0.862	0.687	-0.371	3.705	0.789
EBIT-SAL	0.061	0.057	-0.017	0.209	0.040
ROE	0.141	0.144	-0.409	0.817	0.147
lnSdNI	-0.551	-0.612	-3.784	3.342	1.329
lnSdEBIT	-0.963	-1.116	-3.529	3.369	1.234
C$-CA	0.176	0.125	0.001	0.842	0.179
INCODE	5.084	4.000	2.000	9.000	1.994

Note: Data Source is the “Jaarboek van Nederlandse Ondernemingen".

Number of firms: 118

Other variables are calculated contemporaneously with dependent variables, that is over the sub-period of 1994-1996. The summary statistics of the data is reported in Table 2.

4 The Structural Equation Model (SEM)

A unique and important aspect of the capital structure theory is that many theoretical attributes or factors identified as the determinants of a firm’s capital structure choice are often non-directly observed variables or latent variables. That is, there is no single accounting indicator that can be used as the exact representation of each factor. Consequently, traditional

regression model has often relied on various proxies of the unobserved theoretical attributes for empirical analysis. The main drawbacks of the regression model approach, as also summarized in Titman and Wessels (1988) , are as follows. First, in the case that there are more than one possible proxy for a particular attribute, choosing a single indicator as proxy may lead to biased parameter estimates and invalid test statistics. Second, it is often difficult to find measures of particular attributes that are unrelated to other attributes. Third, since the observed variables are proxies of the attributes, their use in regression analysis introduces an errors-in-variable (EIV) problem which will cause biased parameter estimates. Finally, measurement errors in the proxy variables may be correlated with measurement errors in the dependent variables, creating spurious effects.

The approach used in this paper is the structural equation modeling (SEM) technique, with linear relation among all variables[11]. Very briefly, this method assumes that, although the relevant theoretical attributes are not directly observable, we can observe a number of indicator variables that are linear functions of one or more attributes and a random error term. The model consists of two parts: a structural model that describes the relationship between capital structure and various theoretical attributes, and a measurement model that identifies the relationship between the attributes and various indicators or proxy variables, in this particular case, the accounting data. The capital structure theory does not specify any functional form for how exactly the factors or attributes are related to a firm's leverage and a firm's accounting indicators. In order to estimate the model, we impose the linear structure on all relations. That is, we only intend to investigate the first order relation among all variables, i.e. the sign and significance of the coefficients. The main advantage of the structural equation modeling is that it provides a unique analysis that simultaneously considers questions of both measurement and structural relations. Unlike exploratory factor analysis which is guided by intuitive and *ad hoc* rules, the measurement model casts a factor analysis in the tradition of hypothesis testing with explicit tests of both the overall quality of measurement and the specific factor loadings composing the model. Unlike the multiple regression analysis that are exploring the statistical relationship among only observed variables, the structural model allows for the specification and testing of complex "path" or structural relations.

The model we estimate is an application of the LISREL system developed by K. Jöreskog

[11]References to linear structural modeling can also be found in the literature under the headings of analysis-of-covariance structures, path analysis, causal models, and content-variables models. A nontechnical introduction to the subject providing many references is Bentler and Bonett (1980).

and D. Sörbom (1981). In particular, in our model set-up, only the exogenous variables, i.e. the theoretical attributes of capital structure choice, are unobserved or latent variables, while the endogenous variables , i.e. the leverage measures of a firm, are directly observed, free of measurement error. The measurement model is specified as follows:

$$x = \Lambda\xi + \delta, \tag{1}$$

where x is a $q \times 1$ vector of observable indicators, i.e. accounting data, ξ is an $m \times 1$ vector of unobserved exogenous firm-specific attributes, Λ is a $q \times m$ matrix of factor loadings of x on ξ, and δ is a $q \times 1$ vector of measurement error. In our model, we have 14 indicator variables for eight attributes–thus, x is a matrix of dimension 14×1 and Λ is a matrix of dimension 14×8.

The structural model is specified as the following system of equations:

$$y = \Gamma\xi + \varepsilon, \tag{2}$$

Where y is a $p \times 1$ vector of endogenous variable, i.e. the measures of leverage, Γ is a $p \times m$ matrix of structural coefficients, and ε is a $p \times 1$ vector of disturbance terms. The model is estimated for two separate 2×1 vectors of debt: short-term and long term debt scaled by book value and market value of total capital assets respectively.

Equation (1) simply states that, although the firm-specific attributes that are believed to be the determinants of capital structure cannot be observed, a number of other variables denoted as indicators or proxies are observable. These indicator variables can be expressed as linear function of one or more of the unobservable attributes and a random measurement error. The principal advantage of this estimation procedure over standard regression models is that it explicitly specifies the relation between the unobservable attributes and the observable variables. Equation (2) can be understood as a regression model except that the explanatory variables may be unobserved latent factors.

In order to identify the estimated equations, certain restrictions must be imposed. In most factor-analysis models, the common factors are constrained to be orthogonal and scaled to have unit variances, and the residuals are assumed to be uncorrelated. However, since the common factors in this study are given definite interpretations by identifying them with specific attributes, the assumption that the common factors are uncorrelated is untenable as many firm-specific attributes are likely to be correlated (e.g. profitability and growth). For this reason, the correlations among the unobserved attributes (the matrix Ψ) are estimated

Table 3: The Structure of the Measurement Model– LAMBDA-X

	PROV	TANG	SIZE	GROWTH	PROF	VOLA	FLEX	INDU	δ
PROV-TA	1	0	0	0	0	0	0	0	0
FA-TA	0	1	0	0	0	0	0	0	0
lnSALES	0	0	$\lambda_{3,3}$	0	0	0	0	0	δ_3
lnWORKER	0	0	$\lambda_{4,3}$	0	0	0	0	0	δ_4
lnMV	0	0	$\lambda_{5,3}$	0	0	0	0	0	δ_5
dTA	0	0	0	$\lambda_{6,4}$	0	0	0	0	δ_6
dSALES	0	0	0	$\lambda_{7,4}$	0	0	0	0	δ_7
lnMBR	0	0	0	$\lambda_{8,4}$	0	0	0	0	δ_8
EBIT-SAL	0	0	0	0	$\lambda_{9,5}$	0	0	0	δ_9
ROE	0	0	0	0	$\lambda_{10,5}$	0	0	0	δ_{10}
lnSdNI	0	0	0	0	0	$\lambda_{11,6}$	0	0	δ_{11}
lnSdEBIT	0	0	0	0	0	$\lambda_{12,6}$	0	0	δ_{12}
C$-CA	0	0	0	0	0	0	1	0	0
INCODE	0	0	0	0	0	0	0	1	0

within the model. Of course, in order to achieve identification, additional restrictions on the parameters of the model must be imposed.

In total, we have imposed 106 restrictions on the matrix Λ of factor loadings. These are shown in Table 3 as the factor loadings are exogenously specified to equal either one or zero. For example, since lnSALES is not assumed to be an indicator of TANG, its factor loading on the TANG attribute is set to be zero and is not estimated within the model. In addition, we have also constrained the measurement error in the equation of indicator variables PROV-TA, FA-TA, C$-CA and INCODE to be zero, implying that the factor loadings of these variables on their respective attributes are constrained to equal one. Also, we have assumed that the measurement errors, δ, are uncorrelated with each other, with the attributes, and with the disturbance terms in the structural equations[12].

In contrast to the measurement model, the structural model is totally unrestricted. The model estimates the impact of each of the attributes on each of the different financial leverages. In other words, none of the factor loadings in the structural equations is fixed exoge-

[12]Since the restrictions may not all be appropriate, interpretations of the estimates should be made with caution. It is quite likely, for example, that some of the measurement errors may in fact be correlated. It is unfortunate that there is an arbitrary element in the choice of identifying restrictions. However, similar restrictions must be made implicitly in order to interpret a standard regression model that uses proxy variables.

nously. In addition, the correlations between the residual errors in the structural equations are estimated within the model. This allows for the possibility that there exist additional attributes, not considered in the model, that are determinants of each of the financial leverages.

5 Empirical Results

5.1 Maximum Likelihood (ML) Estimation

The parameters of our model are estimated using the maximum likelihood (ML) method. The basic idea is to fit the covariance matrix of observable variables implied by the specification of the model (Σ) to the covariance matrix (S) of these variables observed from the sampling observations. In the LISREL system, this is done by minimizing the function,

$$F = \ln(\det \Sigma) - \ln(\det S) + tr(S\Sigma^{-1}) - (p+q), \tag{3}$$

with respect to the vector of parameters in the matrices discussed in the previous section. This objective function is derived from maximum-likelihood procedures and assumes that the observed variables are conditionally multinormally distributed.

The asymptotic properties of the ML estimates and the hypothesis test statistics are derived based on large sample size and multivariate normality assumption. To conform with linear structure of the model and the normality assumption, we rescale certain variables by taking logarithms, e.g. as in other studies, for total sales (lnSALES), total workers (lnWORKER), and equity market value (lnMV), which are all proxies for firm size. Different from previous studies, we also rescale the standard deviation of net income (SdNI) and the standard deviation of EBIT (SdEBIT) by taking logarithms, both of which are the proxies of a firm's earning volatility. Standard deviations can only take non-negative values and are obviously not normally distributed. However, both the plots and summary statistics suggest that it is quite reasonable to assume logarithmic standard deviation following normal distribution, for both net income and EBIT. Moreover, our analysis also shows that the parameter estimates based on using SdNI and SdEBIT as proxies of volatility are much less robust than using lnSdNI and lnSdEBIT as proxies for volatility. This is due to the fact that, without rescaling the standard deviation, very high earnings volatilities for certain firms appear to be outliers. In addition, the quality of measurement is also significantly improved

based on lnSdNI and lnSdEBIT. Similar findings are observed for the market book ratio (MBR) after rescaling by taking logarithms (lnMBR).

5.2 Estimates of the Parameters

The estimates of the parameters of the measurement model are reported in Tables 4 and 5. All factor loadings are highly significant. The estimates are generally in accord with our *a priori* ideas about how well the indicator variables measure the unobserved attributes. Both the direction and the magnitude, as well as the statistical significance, of the estimates suggest that these indicators capture the theoretical attributes we wish to consider as determinants of capital structure choice.

The estimates of the structural coefficients are reported in Table 6. These coefficients specify the estimated impact of various attributes or factors on the financial leverages. For the most part, the coefficient estimates for the long-term and short-term leverages are of the predicted sign from our earlier discussion. The estimation results are summarized as follows. Firstly, among the most significant factors of the capital structure choice are the PROV, TANG, SIZE and FLEX, while GROWTH, PROF, VOLA and INDU are among the least significant factors. Secondly, PROV and FLEX are both negatively related to a firm's long-term and short-term leverages, regardless whether it is measured by book value or market value. However, for the market value based short-term leverage, these two factors are not highly significant. Thirdly, TANG is positively correlated with both book value and market value based long-term leverages, but negatively correlated with short-term leverages, although not highly significant for market value based short-term leverage. SIZE is positively related to both book value and market value based long-term leverages, but has mixed signs for short-term leverage when measured by book value, although neither of them is highly significant. Fourthly, among all four leverage measures, the long-term leverages, measured by both book value and market value, behave most systematically with three highly significant factors, i.e. PROV, TANG, and SIZE. To the contrast, the short-term leverages behave less systematically, with the book value based short-term leverage having three highly significant factors, i.e. PROV, TANG and FLEX, while the market value based short-term leverage having no significant factors (at 10% critical level). Finally, based on the goodness-of-fit tests, the estimated models explain virtually none of the cross-sectional variation in a firm's leverage.

Table 4: Measurement Model: Factor Loadings for Independent Variables-LAMBDA-X

	PROV	TANG	SIZE	GROWTH	PROF	VOLA	FLEX	INDU	σ^2_δ
PROV-TA	1.00	- -	- -	- -	- -	- -	- -	- -	0.00
FA-TA	- -	1.00	- -	- -	- -	- -	- -	- -	0.00
lnSALES	- -	–	0.96	- -	- -	- -	- -	- -	0.07
			(0.06)						
			15.81						
lnWORKER	- -	- -	0.97	- -	- -	- -	- -	- -	0.05
			(0.06)						
			16.15						
lnMV	- -	- -	0.91	- -	- -	- -	- -	- -	0.17
			(0.06)						
			14.33						
dTA	- -	- -	- -	0.68	- -	- -	- -	- -	0.54
				(0.08)					
				8.45					
dSALES	- -	- -	- -	0.43	- -	- -	- -	- -	0.82
				(0.09)					
				5.01					
lnMBR	- -	- -	- -	0.87	- -	- -	- -	- -	0.25
				(0.08)					
				11.26					
EBIT-SAL	- -	- -	- -	- -	0.60	- -	- -	- -	0.64
					(0.08)				
					7.24				
ROE	- -	- -	- -	- -	0.71	- -	- -	- -	0.50
					(0.08)				
					8.57				
lnSdNI	- -	- -	- -	- -	- -	0.82	- -	- -	0.32
						(0.07)			
						11.00			
lnSdEBIT	- -	- -	- -	- -	- -	0.83	- -	- -	0.32
						(0.07)			
						11.07			
C$-CA	- -	- -	- -	- -	- -	- -	1.00	- -	0.00
INCODE	- -	- -	- -	- -	- -	- -	- -	1.00	0.00

Table 5: Estimated Correlations between Attributes

Attributes	PROV	TANG	SIZE	GROWTH	PROF	VOLA	FLEX	INDU
PROV	1.00							
	(0.12)							
	8.57							
TANG	0.13	1.00						
	(0.08)	(0.12)						
	1.54	8.57						
SIZE	0.37	0.13	1.00					
	(0.08)	(0.08)						
	4.61	1.52						
GROWTH	-0.05	-0.38	0.22	1.00				
	(0.09)	(0.09)	(0.09)					
	-0.55	-4.32	2.41					
PROF	0.00	-0.28	0.34	0.79	1.00			
	(0.11)	(0.10)	(0.10)	(0.08)				
	-0.05	-2.68	3.46	9.82				
VOLA	-0.14	0.08	-0.40	-0.49	-0.83	1.00		
	(0.09)	(0.09)	(0.08)	(0.08)	(0.07)			
	-1.53	0.84	-4.99	-5.76	-11.13			
FLEX	0.08	-0.11	0.09	0.22	0.35	-0.22	1.00	
	(0.08)	(0.08)	(0.08)	(0.09)	(0.10)	(0.09)	(0.12)	
	1.01	-1.35	1.02	2.42	3.36	-2.47	8.57	
INDU	0.10	-0.15	0.07	0.34	0.40	-0.15	0.30	1.00
	(0.08)	(0.08)	(0.08)	(0.09)	(0.10)	(0.09)	(0.09)	(0.12)
	1.23	-1.83	0.83	3.77	3.92	-1.60	6.49	6.66

Table 6: Estimates of Structural Coefficients-GAMMA

	PROV	TANG	SIZE	GROWTH	PROF	VOLA	FLEX	INDU
LEVBL	-0.26	0.51	0.35	0.49	-0.40	0.19	-0.16	0.09
	(0.11)	(0.08)	(0.09)	(0.35)	(0.80)	(0.49)	(0.10)	(0.14)
	-2.37	6.08	3.83	1.39	-0.50	0.38	-1.72	0.61
LEVBS	-0.34	-0.27	-0.04	0.05	-0.52	-0.15	-0.26	0.05
	(0.12)	(0.09)	(0.10)	(0.39)	(0.93)	(0.59)	(0.11)	(0.17)
	-2.69	-3.01	-0.46	0.13	-0.57	-0.25	-2.49	0.31
LEVML	-0.22	0.45	0.32	0.20	-0.66	-0.05	-0.13	0.21
	(0.11)	(0.09)	(0.10)	(0.30)	(0.64)	(0.41)	(0.10)	(0.13)
	-2.03	5.24	3.29	0.66	-1.03	-0.13	-1.29	1.60
LEVMS	-0.60	-0.30	0.10	0.68	-2.74	-1.58	-0.02	0.50
	(0.74)	(0.27)	(0.37)	(2.46)	(6.01)	(3.79)	(0.61)	(1.00)
	-0.82	-1.12	0.28	0.28	-0.46	-0.42	-0.04	0.50

5.3 Robustness of Estimation Results

As we have mentioned earlier, inappropriate scaling of observed variables may cause the estimation results to be non-robust. In this paper, we have carefully re-scaled the observed variables, in particular the proxies of GROWTH and VOLA. An examination of the correlation matrix of the sample data (Tables 7 and 8) provides further insights about the robustness of our results.

From Tables 7 and 8, we can see that firstly, there are no pair of variables, as proxies of different factors, that are highly correlated. This suggests that no individual variable will likely cause serious spurious effect. Secondly, there is no proxy variable that is highly correlated with all leverage measures. Noticeably, while FA-TA has relatively high correlations with LEVBL and LEVMS, the correlations with LEVBS and LEVML are very low. This suggests that there is no obvious spurious effect caused by scaling (i.e. divided by TA).

However, a further examination of the correlation matrix of all factors or attributes suggest that we have to be very careful in interpreting the estimation results in a multivariate model framework. Notice from Table 5 that GROWTH, PROF and VOLA in our sample of Dutch firms are all highly correlated with each other, namely corr(GROWTH, PROF)=0.55 (0.09), corr(GROWTH, VOLA)= -0.39 (0.08), and corr(PROF, VOLA)=-0.85 (0.07), where the numbers in the brackets are standard errors. The estimation results suggest that in the multivariate model, none of GROWTH, PROF and VOLA is a significant factor of the capital

Table 7: Correlation Matrix of Sample Data

	LEVBL	LEVBS	LEVMS	LEVMS	PROV-TA	FA-TA	lnSALES	lnWORKER	lnMV
LEVBL	1.000								
LEVBS	0.591	1.000							
LEVML	0.840	0.075	1.000						
LEVMS	0.083	0.909	0.196	1.000					
PROV-TA	-0.119	-0.384	-0.029	-0.342	1.000				
FA-TA	0.463	-0.186	0.543	-0.093	0.128	1.000			
lnSALES	0.168	-0.266	0.119	-0.227	0.352	0.096	1.000		
lnWORKER	0.228	-0.348	0.169	-0.318	0.388	0.156	0.936	1.000	
lnMV	0.156	-0.351	-0.026	-0.395	0.257	0.0636	0.880	0.881	1.000
dTA	-0.174	-0.248	-0.240	-0.302	0.015	-0.236	0.054	0.077	0.111
dSALES	-0.005	-0.128	-0.162	-0.266	0.003	-0.117	0.027	0.045	0.139
lnMBR	0.031	-0.153	-0.307	-0.310	-0.065	-0.346	0.163	0.194	0.371
EBIT-SAL	0.048	-0.313	-0.185	-0.383	-0.077	0.017	0.150	0.236	0.470
ROE	-0.258	-0.195	-0.330	-0.306	0.046	-0.318	0.202	0.179	0.288
lnSdNI	0.216	0.347	0.287	0.384	-0.147	0.013	-0.262	-0.249	-0.340
lnSdEBIT	0.183	0.248	0.300	0.268	-0.083	0.113	-0.371	-0.352	-0.389
C$-CA	-0.259	-0.386	-0.290	-0.376	0.083	-0.112	0.041	0.066	0.237
INCODE	-0.063	-0.193	-0.093	-0.164	0.102	-0.153	0.052	0.052	0.152

	dTA	dSALES	lnMBR	EBIT-SAL	ROE	lnSdNI	lnSdEBIT	C$-CA	INCODE
dTA	1.000								
dSALES	0.550	1.000							
lnMBR	0.571	0.312	1.000						
EBIT-SAL	0.165	0.221	0.397	1.000					
ROE	0.465	0.164	0.499	0.433	1.000				
lnSdNI	-0.396	-0.212	-0.356	-0.456	-0.424	1.000			
lnSdEBIT	-0.258	-0.092	-0.309	-0.466	-0.484	0.680	1.000		
C$-CA	0.181	0.014	0.191	0.309	0.177	-0.226	-0.143	1.000	
INCODE	0.180	0.033	0.326	0.145	0.345	-0.135	-0.106	0.300	1.000

Table 8: Correlation Matrix of Sample Data(continued)

structure choice. In other words, given other factors, none of the above factors individually has a significant impact on the choice of a firm's leverage. This does not mean that as these factors all change together, there is no significant statistical relation between a firm's leverage and each specific factor. For instance, if a theory predicts that growth is a significant determinant of capital structure choice without specifying the environment, including the correlations with other variables, then the findings of our model estimation is not necessarily inconsistent with the theory. Furthermore, from the correlation matrix of the sample data in Tables 7 and 8, we notice that not all proxies for the same factor or attribute have the same signs of correlations with a specific leverage measure. For instance, for GROWTH proxies, while the correlations between LEVBL and proxies dTA and lnMBR are negative, the correlation between LEVBL and dSALES is positive. Similar findings are observed for the proxies of PROF. While the findings by no means undermine our estimation results, they suggest that choosing any one of the indicators as a single proxy of a factor may cause severely biased parameter estimates and change the significance level of the tests.

5.4 Further Discussions

Our model has identified certain important factors, which have so far been ignored in previous studies as determinants, of capital structure choice for Dutch firms. Firstly, provision ratio as non-debt tax shield is shown to be negatively correlated with a firm's financial leverage. This suggests that the "static trade-off" hypothesis is strongly supported by the Dutch evidence. Secondly, financial flexibility, measured by the ratio of cash and marketable securities over current assets is also shown to be negatively correlated with a firm's financial leverages. Since a firm's financial flexibility can also be viewed as internal debt, it provides evidence to support the "pecking-order" behavior. However, from the mixing results of other factors, the rationale of asymmetric information behind the "pecking-order" hypothesis is not evident in the Dutch case. To the contrary, the asymmetric information argument is more rejected than accepted. As predicted by the asymmetric information theory, growth, profitability and earnings volatility should all be negatively related to a firm's financial leverages. Our empirical results suggest that signs between growth and leverages are consistently contrary to what predicted by the theory. At the best, growth is an insignificant factor of capital structure for Dutch firms. A plausible explanation is that since 97% of the private debt is issued by banks and other financial institutions instead of the capital market in the Nether-

lands, and on average, there is a representative of the lenders sitting in the board of directors, there is less degree of information asymmetry between the lenders and the borrowers, i.e. the firms.

Furthermore, the fact that financial flexibility is negatively related to a firm's leverages may make people draw the conclusion that the corporate management of Dutch firms is in general entrenched. This conclusion appears to be further supported by the argument that there is a lack of market for corporate control in the Netherlands (De Jong and Veld, 2001). However, it should be cautioned that the negative sign be interpreted as the result of management entrenchment. This observation can also be caused by the fact that the management of Dutch firms is extremely risk averse due to the stringent bankruptcy laws.

Finally, our empirical results also show that while tangibility is positively correlated with long-term leverage, it is negatively correlated with short-term leverage, for both book-value and market-value measures. Since tangibility measures the level of collateral assets, it is safe to assume that firms with higher tangibility are more accessible to loans. Thus the above results suggest that firms, when they can choose, tend to prefer long-term debt to short-term debt.

6 Conclusion

This paper uses the structural equation modeling (SEM) technique to empirically test the determinants of capital structure choice for Dutch firms. We include major factors identified by various capital structure theories and construct proxies for these factors with consideration of specific Dutch institutional settings. We also carefully rescale the observed variables in order to conform with the linear structure of the model and the multivariate normality assumption. Our empirical results shed many important insights on the Dutch firms' financing behavior. In particular, we identified important factors that have so far been ignored in the literature for the Dutch capital structure choice. Furthermore, our results provide evidence supporting the "static trade-off" hypothesis. While our results also imply the "pecking-order" behavior of Dutch firms, they cast doubt on the rationale of asymmetric information behind the "pecking-order" hypothesis. We also point out that the static cross-section analysis is not sufficient to conclude whether or not the management of Dutch firms is entrenched. Models based on dynamic behavior of firms' capital structure choice are called for such tests, which

we will pursue in a separate study.

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